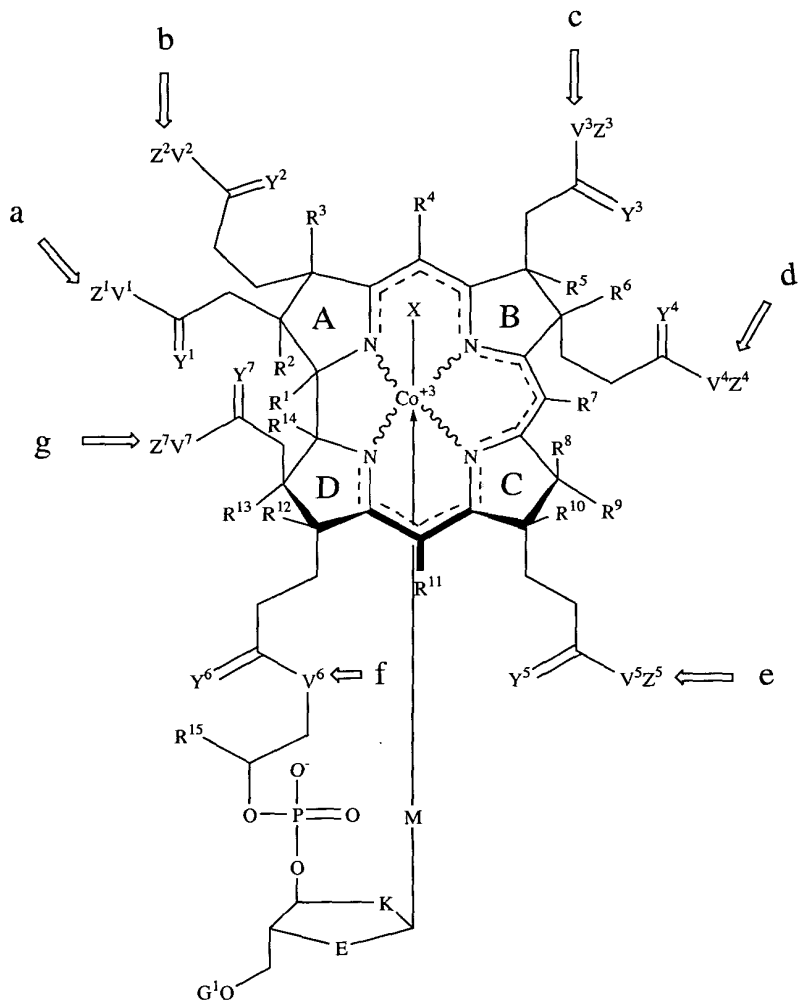
WE CLAIM:

1. A compound of the formula (**I**):



(**I**)

or its enantiomer, diastereomer or its pharmaceutically acceptable salt, wherein:

(i) the wavy line in the chemical structure indicates either a dative or covalent bond such that there are three dative Co-N bonds and one covalent Co-N bond, wherein, in the case of the dative bond, the valence of nitrogen is completed either with a double bond with an adjacent ring carbon or with a hydrogen;

(ii) the dotted line in the chemical structure indicates either a double or single bond such that the double bond does not over-extend the valence of the element (i.e. to give pentavalent carbons) and, in the case of a single bond, the valence is completed with hydrogen;

(iii) X is hydrogen, cyano, halogen (Cl, F, Br or I), haloalkyl (including CF_3, CF_2CF_3, CH_2CF_3 and CF_2Cl), NO, NO_2, NO_3, phosphonate (including alkyl-$P(O)_2OR^{15}$), $PR^{15}R^{16}R^{17}$, NH_2, $NR^{15}R^{16}$, OH, OR^{15}, SR^{15}, SCN, N_3, $OC(O)R^{15}$, $C(O)_2R^{15}$, $C(O)R^{15}$, $OC(O)NR^{15}R^{16}$, $C(O)_2NR^{15}R^{16}$, $C(O)NR^{15}R^{16}$, $P(O)_2OR^{15}$, $S(O)_2OR^{15}$, a purine or pyrimidine nucleoside or nucleoside analog, adenosyl, 5-FU, alkyl, alkenyl, alkynyl, aryl, aralkyl, alkaryl, amino acid, peptide, protein, carbohydrate, heteroalkyl, heterocycle, heteroaryl or alkylheteroaryl;

(iv) M is a monovalent heterocycle or heteroaromatic, which is capable of binding to the adjacent sugar ring, and forming a dative bond with Co^{+3};

(v) K is O, S, NJ^1, C(OH)H, $CR^{100}R^{101}$ or $C(R^{100})V^8Z^8$;

(vi) E is O or S;

(vii) G^1 is hydrogen, alkyl, acyl, silyl, phosphate or L-T;

(viii) Y^1, Y^2, Y^3, Y^4, Y^5, Y^6 and Y^7 independently are O, S or NJ^2;

(ix) V^1, V^2, V^3, V^4, V^5, V^6, V^7 and V^8 independently are O, S, NJ^3, $CR^{102}R^{103}$ or a direct bond;

(x) Z^1, Z^2, Z^3, Z^4, Z^5, Z^7 and Z^8 independently are R^{104} or L-T;

(xi) each L is independently a direct bond or linker, of a singular molecular weight, to one or more T moieties, and that does not significantly impair the ability of the TC- or IF-binding carrier to bind to a transcobalamin receptor, optionally when bound to a transport protein;

(xii) each T independently comprises the residue of a therapeutic and/or diagnostic agent effective for the treatment, prophylaxis and/or diagnosis of a proliferative disorder, optionally bound though a chelating moiety;

(xiii) at least one of Z^1, Z^2, Z^3, Z^4, Z^5, Z^7, Z^8, K and G^1 is L-T;

(xiv) J^1, J^2 and J^3 independently are hydrogen, alkyl, alkenyl, alkynyl, alkaryl, cycloalkyl, aryl, cycloaryl, heteroalkyl, heterocycle, heteroaryl, hydroxyl, alkoxy or amine;

(xv) R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13} and R^{14} independently are hydrogen, lower alkyl, lower alkenyl, lower alkynyl, lower cycloalkyl, heteroalkyl, heterocyclic, lower alkoxy, azido, amino, lower alkylamino, halogen, thiol, SO_2, SO_3, carboxylic acid, C_{1-6} carboxyl, hydroxyl, nitro, cyano, oxime or hydrazine;

(xvi) R^{13} and R^{14} optionally can form a double bond;

(xvii) R^{15}, R^{16} and R^{17} are independently hydrogen, alkyl, alkenyl, alkynyl, aryl, alkaryl or aralkyl group, heteroalkyl, heterocycle or heteroaromatic; and

(xviii) R^{100}, R^{101}, R^{102}, R^{103}, and R^{104} are independently hydrogen, alkyl, alkenyl, alkynyl, aryl, acyl, heteroaromatic, heteroaryl, heteroalkyl, hydroxyl, alkoxy, cyano, azido, halogen, nitro, SO_2, SO_3, thioalkyl or amino;

(xix) wherein at least one of Y, R, G, E, K, M and V is not as it is found in natural vitamin B_{12}.

2. The compound of claim 1, wherein at least one T is selected from the group consisting of cisplatin, taxol, taxotere (docetaxel), daunorubicin (daunomycin; rubidomycin), doxorubicin, rubidazone and idarubicin (idamycin; 4-demethoxy-daunorubicin).

3. The compound of claim 1, wherein at least one T is a detectable and/or therapeutic radionuclide.

4. The compound of any one of claims 1-3, wherein at least one L is independently an amine, a polyamine, an amino acid, a poly(amino acid) or peptide linker;

5. The compound of any one of claims 1-3, wherein at least one –L-T is independently a poly(amino acid) residue bound to one or more T.

6. The compound of claim 5, wherein at least one –L-T is independently a poly-L-lysine -NR'(CH((CH$_2$)$_4$-NHR')CONR')$_m$R', wherein each R' is independently hydrogen, lower alkyl or T; and m is 2-20.

7. The compound of any one of claims 1-3, wherein at least one –L-T is independently a polyamine residue of the formula -NR'(alkylene-NR')$_n$alkyleneNR'R', wherein each R' is independently hydrogen, lower alkyl or T and n is 1-20.

8. The compound of claim 7, wherein -NR'(alkylene-NR')$_n$alkyleneNR' is selected from the group consisting of -NR'(CH$_2$)$_3$NR'(CH$_2$)$_4$NR'(CH$_2$)$_3$NR'R' (spermine); -NR'(CH$_2$)$_3$NR'(CH$_2$)$_4$NR'R' (spermidine); decamethylene tetraamine and pentamethylene hexamine.

9. The compound of any one of claims 1-3, wherein at least one –L-T is independently a diamine residue of the formula -NR'(alkylene)$_x$NR'R', wherein each R' is independently hydrogen, lower alkyl or T and x is 2-20.

10. The compound of claim 9, wherein -NR'(alkylene)$_x$NR'R' is selected from the group consisting of 1,6-diaminohexane, 1,5-diaminopentane, 1,4-diaminobutane and 1,3-diaminopropane.

11. The compound of claim 1, wherein T is not a residue of a therapeutic agent selected from the group consisting of hormone, growth factor, interleukin, cytokines, lymphokines, GCSF, EPO, interferon (α, β, γ), calcitonin, TRH, vasopressin, desmopressin [Folia Endocrinologica Japonica 54, No. 5, p. 676-691

(1978)], oxytocin, insulin, Growth Hormone, testosterone, somatotrophin, somatostatin (U.S. Patent Nos. 4,087,390 and 4,100,117), SCGF, (stem cell growth factor), CGRP, Erythropoietin, Colony Stimulating factors (GCSF, GM-CSF, CSF), pregnant mare serum gonadotrophin (PMSG), human chorionic gonadotrophin (HCG), Inhibin, PAI-2; neomycin, salbutamol, pyrimethamine, penicillin G, methicillin, carbenicillin, pethidine, xylazine, ketamine, mephenesin, GABA, iron dextran, nucleotide analogues or ribozyme, prolactin, adrenocorticotropic hormone (ACTH), melanocyte stimulating hormone (MSH), thyroid hormone releasing hormone (TRH) (U.S. Patent No. 4,100,152), thyroid stimulating hormone (TSH), luteinizing hormone (LH), luteinizing hormone releasing hormone (LHRH), follicle stimulating hormone (FSH), oxytocin, calcitonin, parathyroid hormone, glucagon, gastrin, secretin, pancreozymin, cholecystokinin angiotensin, human placental lactogen, human chorionic gonadotropin (HCG), enkephalin [U.S. Pat. No. 4,277,394, European patent application Publication No. 31567], endorphin, kyotorphin, interleukins (I, II, and III), tuftsin, thymopoietin, thymosin, thymostimulin, thymic humoral factor (TFH), serum thymic factor (FTS) (U.S. Patent No. 4,229,438), thymic factors [Medicine in Progress 125, No. 10, p.835-843 (1983)], tumor necrosis factor (TNF), colony stimulating factor (CSF), motilin, dinorphin, bombesin, neurotensin, cerulein, bradykinin, urokinase, asparaginase, kallikrein, substance P analogue and antagonist, nerve growth factor, blood coagulation factors VIII and IX, lysozyme chloride, polymixin B, colistin, gramicidin, bacitracin, protein synthesis stimulating peptides (British patent No. 8232082), gastric inhibitory polypeptide (GIP), vasoactive intestinal polypeptide (VIP), platelet-derived growth factor (PDGF), growth hormone factor (GRF, somatocrinin), bone morphogenetic protein (BMP), epidermal growth factor (EGF), bleomycin, methotrexate, actinomycin D, mitomycin C, vinblastine sulfate, vincristine sulfate, daunorubicin, adriamycin, neocarzinostatin, cytosine arabinoside, fluorouracil, tetrahydrofuryl-5-fluorouracil, krestin, picibanil, lentinan, levamisole, bestatin, azimexon, glycyrrhizin, poly I:C, poly A:U and poly ICLC, gentamicin, dibekacin, kanendomycin, lividomycin, tobramycin, amikacin, fradiomycin, sisomicin, tetracycline hydrochloride, oxytetracycline hydrochloride, rolitetracycline, doxycycline hydrochloride, ampicillin, piperacillin, ticarcillin, cephalothin, cephaloridine, cefotiam, cefsulodin, cefmenoxime, cefmetazole, cefazolin, cefotaxime, cefoperazone,

ceftizoxime, moxolactam, latamoxef, thienamycin, sulfazecin, azthreonam, sodium salicylate, sulpyrine, sodium flufenamate, sodium diclofenac, sodium indomethacin, morphine hydrochloride, pethidine, levorphanol tartrate, oxymorphone, ephedrine, methylephedrine, noscapine, codeine phosphate, dihydrocodeine, phosphate, alloclamide, chlophedianol, picoperidamine, cloperastine, protokylol, isoproterenol, salbutamol, terbutaline sulfate, chlorpromazine, prochlorperazine, trifluoperazine, atropine sulfate, scopolamine methylbromide, pridinol methanesulfonate, tubocurarine chloride and pancuronium bromide, sodium phenytoin, ethosuximide, sodium acetazolamide, chlordiazepoxide hydrochloride, metoclopramide and L-histidine monohydrochloride, imipramine, clomipramine, noxiptiline, phenelzine sulfate, diphenhydramine, chlorpheniramine maleate, tripelenamine, methdilazine, clemizole, diphenylpyraline, methoxyphenamine, trans-p-oxocamphor, theophyllol, aminophylline, etilefrine, propranolol, alprenolol, bufetolol, oxyprenolol, oxyfedrine, diltiazem, tolazoline, hexobendine, bamethan sulfate, hexamethonium bromide, pentolinium, mecamlamine, ecarazine, clonidine, sodium glymidine, glypizide, phenformin, buformin, metformin, sodium heparin, sodium citrate, thromboplastin, thrombin, menadione sodium bisulfite, acetomenaphthone, .epsilon.-amino-caproic acid, tranexamic acid, carbazochrome sodium sulfonate, adrenochrome monoaminoguanidine methanesulfonate, isoniazid, ethambutol, sodium p-aminosalicylate, prednisolone succinate, prednisolone sodium phosphate, dexamethasone sodium sulfate, betamethasone sodium phosphate, hexestrol phosphate, hexestrol· acetate, methimazole, levallorphan tartrate, nalorphine hydrochloride and naloxone hydrochloride; a protein derived from or immunogens against influenza, measles, Rubella, smallpox, yellow fever, diphtheria, tetanus, cholera, plague, typhus, BCG, tuberculosis causing agents, Haemophilus influenzae, Neisseria catarrhalis, Klebsiella pneumoniae, pneumococci, streptococci; a secretory product derived from diphtheria, tetanus, cholera, plague, typhus, tuberculosis causing agents, Haemophilus influenzae, Neisseria catarrhalis, Klebsiella pneumoniae, pneumococci, streptococci, Streptococcus mutans, or is derived from a malarial parasite or the causative agent of coccidiosis in chickens.

Patent Application Publication Feb. 5, 2004

12. A pharmaceutical composition for the treatment, prophylaxis and/or diagnosis of a proliferative disorder in a host comprising a compound of any one of claims 1-11, or the pharmaceutically acceptable salt thereof, in combination with a pharmaceutically acceptable carrier.

13. A pharmaceutical composition for the treatment, prophylaxis and/or diagnosis of a proliferative disorder in a host comprising a compound of any one of claims 1-11, or the pharmaceutically acceptable salt thereof, optionally in a pharmaceutically acceptable carrier, in combination with one or more other therapeutic and/or diagnostic agent(s).

14. The pharmaceutical composition of claim 12 or 13, wherein the host is a human.

15. A method for the treatment, prophylaxis and/or diagnosis of a proliferative disorder in a host comprising administering an effective amount of a compound of any one of claims 1-11, or the pharmaceutically acceptable salt thereof, optionally in a pharmaceutically acceptable carrier.

16. A method for the treatment, prophylaxis and/or diagnosis of a proliferative disorder in a host comprising administering an effective amount of a compound of any one of claims 1-11, or the pharmaceutically acceptable salt thereof, optionally in a pharmaceutically acceptable carrier, in combination or alternation with one or more other effective therapeutic and/or diagnostic agent.

17. The method of claim 15 or 16, wherein the host is a human.

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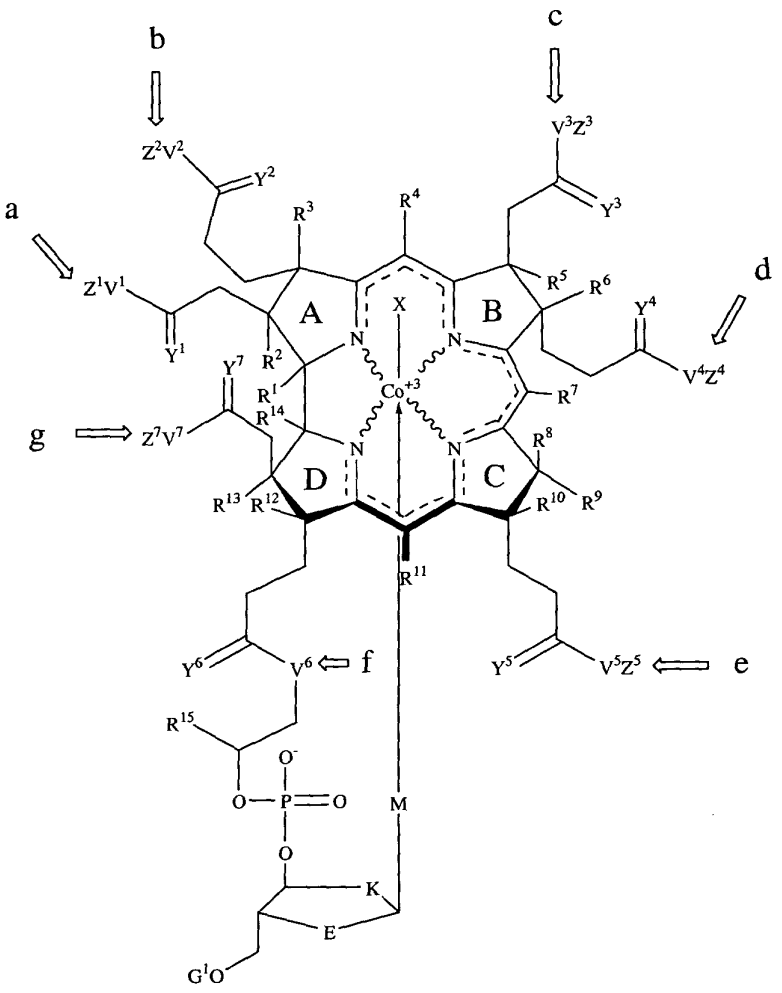
18. A method for the treatment, prophylaxis and/or diagnosis of a proliferative disorder other than neoplasms in a host comprising administering an effective amount of a compound of the formula (**I**):



(**I**)

or its enantiomer, diastereomer or its pharmaceutically acceptable salt, wherein:

(i) the wavy line in the chemical structure indicates either a dative or covalent bond such that there are three dative Co-N bonds and one covalent Co-N bond, wherein, in the case of the dative bond, the valence of nitrogen is completed either with a double bond with an adjacent ring carbon or with a hydrogen;

(ii) the dotted line in the chemical structure indicates either a double or single bond such that the double bond does not over-extend the valence of the

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element (i.e. to give pentavalent carbons) and, in the case of a single bond, the valence is completed with hydrogen;

(iii) X is hydrogen, cyano, halogen (Cl, F, Br or I), haloalkyl (including CF_3, CF_2CF_3, CH_2CF_3 and CF_2Cl), NO, NO_2, NO_3, phosphonate (including alkyl-$P(O)_2OR^{15}$), $PR^{15}R^{16}R^{17}$, NH_2, $NR^{15}R^{16}$, OH, OR^{15}, SR^{15}, SCN, N_3, $OC(O)R^{15}$, $C(O)_2R^{15}$, $C(O)R^{15}$, $OC(O)NR^{15}R^{16}$, $C(O)_2NR^{15}R^{16}$, $C(O)NR^{15}R^{16}$, $P(O)_2OR^{15}$, $S(O)_2OR^{15}$, a purine or pyrimidine nucleoside or nucleoside analog, adenosyl, 5-FU, alkyl, alkenyl, alkynyl, aryl, aralkyl, alkaryl, amino acid, peptide, protein, carbohydrate, heteroalkyl, heterocycle, heteroaryl or alkylheteroaryl;

(iv) M is a monovalent heterocycle or heteroaromatic, which is capable of binding to the adjacent sugar ring, and forming a dative bond with Co^{+3};

(v) K is O, S, NJ^1, C(OH)H, $CR^{100}R^{101}$ or $C(R^{100})V^8Z^8$;

(vi) E is O or S;

(vii) G^1 is hydrogen, alkyl, acyl, silyl, phosphate or L-T;

(viii) Y^1, Y^2, Y^3, Y^4, Y^5, Y^6 and Y^7 independently are O, S or NJ^2;

(ix) V^1, V^2, V^3, V^4, V^5, V^6, V^7 and V^8 independently are O, S, NJ^3, $CR^{102}R^{103}$ or a direct bond;

(x) Z^1, Z^2, Z^3, Z^4, Z^5, Z^7 and Z^8 independently are R^{104} or L-T;

(xi) each L is independently a direct bond or linker, to one or more T moieties, and that does not significantly impair the ability of the TC- or IF-binding carrier to bind to a transcobalamin receptor, optionally when bound to a transport protein;

(xii) each T independently comprises the residue of a therapeutic and/or diagnostic agent effective for the treatment, prophylaxis and/or diagnosis of a proliferative disorder, optionally bound though a chelating moiety;

(xiii) at least one of Z^1, Z^2, Z^3, Z^4, Z^5, Z^7, Z^8, K and G^1 is L-T;

(xiv) J^1, J^2 and J^3 independently are hydrogen, alkyl, alkenyl, alkynyl, alkaryl, cycloalkyl, aryl, cycloaryl, heteroalkyl, heterocycle, heteroaryl, hydroxyl, alkoxy or amine;

(xv) R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13} and R^{14} independently are hydrogen, lower alkyl, lower alkenyl, lower alkynyl, lower cycloalkyl, heteroalkyl, heterocyclic, lower alkoxy, azido, amino, lower alkylamino, halogen, thiol, SO_2, SO_3, carboxylic acid, C_{1-6} carboxyl, hydroxyl, nitro, cyano, oxime or hydrazine;

(xvi) R^{13} and R^{14} optionally can form a double bond;

(xvii) R^{15}, R^{16} and R^{17} are independently hydrogen, alkyl, alkenyl, alkynyl, aryl, alkaryl or aralkyl group, heteroalkyl, heterocycle or heteroaromatic; and

(xviii) R^{100}, R^{101}, R^{102}, R^{103}, and R^{104} are independently hydrogen, alkyl, alkenyl, alkynyl, aryl, acyl, heteroaromatic, heteroaryl, heteroalkyl, hydroxyl, alkoxy, cyano, azido, halogen, nitro, SO_2, SO_3, thioalkyl or amino;

optionally in a pharmaceutically acceptable carrier.

19. A method for the treatment, prophylaxis and/or diagnosis of a proliferative disorder other than neoplasms in a host comprising administering an effective amount of a compound of claim 18, optionally in a pharmaceutically acceptable carrier, in combination or alternation with one or more other effective therapeutic and/or diagnostic agent(s).

20. The method of claim 18 or 19, wherein at least one L is a linker of singular molecular weight.

21. The method of claim 18 or 19, wherein at least one L is independently an amine, a polyamine, an amino acid, a poly(amino acid) or peptide linker.

22. The method of claim 18 or 19, wherein at least one –L-T is independently a poly(amino acid) residue bound to one or more T.

23. The method of claim 22, wherein at least one –L-T is independently a poly-L-lysine -NR'(CH((CH_2)$_4$-NHR')CONR')$_m$R', wherein each R' is independently hydrogen, lower alkyl or T; and m is 2-20.

24. The method of claim 18 or 19, wherein at least one –L-T is independently a polyamine residue of the formula -NR'(alkylene-NR')$_n$alkyleneNR'R', wherein each R' is independently hydrogen, lower alkyl or T and n is 1-20.

25. The method of claim 24, wherein -NR'(alkylene-NR')$_n$-alkyleneNR' is selected from the group consisting of -NR'(CH_2)$_3$NR'(CH_2)$_4$NR'-(CH_2)$_3$NR'R' (spermine); -NR'(CH_2)$_3$NR'(CH_2)$_4$-NR'R' (spermidine); deca-methylene tetraamine and pentamethylene hexamine.

26. The method of claim 18 or 19, wherein at least one –L-T is independently a diamine residue of the formula -NR'(alkylene)$_x$NR'R', wherein each R' is independently hydrogen, lower alkyl or T and x is 2-20.

27. The method of claim 26, wherein -NR'(alkylene)$_x$NR'R' is selected from the group consisting of 1,6-diaminohexane, 1,5-diaminopentane, 1,4-diaminobutane and 1,3-diaminopropane.

28. The method of any one of claims 18-27, wherein the host is a human.

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